The Excavating Engineer

Vol. 17 MARCH 1923 No. 3

Irrigation Development in Siam

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Description of the Prasak Canal Project in the Central Plain of Siam, the most extensive irrigation development ever carried out in that country, on which four large dragline excavators, two hydraulic dredges, and one railroad-type steam shovel, all of American manufacture, were employed.

IN the year 1913 the Government of Siam, owing to the almost total failure of the rice crop of the previous year, decided to reopen the question of irrigation to avoid a repetition of such a calamity; for calamity it is indeed when the rice crop fails in Siam, as the whole prosperity of the country, both internal and external, depends solely upon the rice crop.

Irrigation is not altogether new in Siam, but the project described in this paper is the first attempt to carry irrigation along scientific lines. The largest of the schemes as carried out previously is known as the Rangsit Concession, and deserves particular mention in that it is of considerable magnitude, affecting some 400,000 acres, also because it becomes a part of the project now being carried out which will be mentioned later.

In 1913 the Agricultural Ministry, which has charge of irrigation work, applied for expert assistance to the Government of India, and were fortunate in securing the services of Mr. (now Sir) T. R. J. Ward to draw up projects and estimates for irrigating the whole of the great central plain of Siam. Mr. Ward brought with him from India a special staff of irrigation engineers, the chief of whom, Mr. R. C. R. Wilson, was appointed Director General of the newly constituted Irrigation Department on Mr. Ward's return to India. Later, two other engineers, both belonging to the Indian Irrigation Service, were loaned by the Government of India: Mr. C. D. Gee, who was appointed Deputy Director, and Mr. P. H. Lee, as Superintendent of Works. Under the direction of these officers the project now described has been carried out.

The Prasak Project—The General Scheme

This scheme, known as the Prasak Project, consists of a barrage or diversion dam across the Prasak River, 32 kilometers of main canal and two branch canals each about 30 kilometers in length, connecting the main canal with the Rangsit District; also a number of distributaries branching off from the main canal which are in turn broken up into smaller water courses, forming a very complete network of ditches throughout the irrigable area of the district, which is about 625,000 Rai or 250,000 acres. The Rangsit Scheme, which was put through by private interests some years ago, and to which a large part of this Prasak water will flow, was worked out in very much the form of a gridiron. This scheme was not entirely successful, for unless the rivers commanding the area were in high flood the rice crop could not be completely inundated, and when these floods occurred it was often at the wrong time. Under the new scheme the supply will be completely controlled. The original canals were also used as a means of transportation, for in Siam most all transportation is by water, as there are no roads and few railroads. They will still be used for this purpose, and they will also be made to form a more or less efficient drainage system which is badly needed.

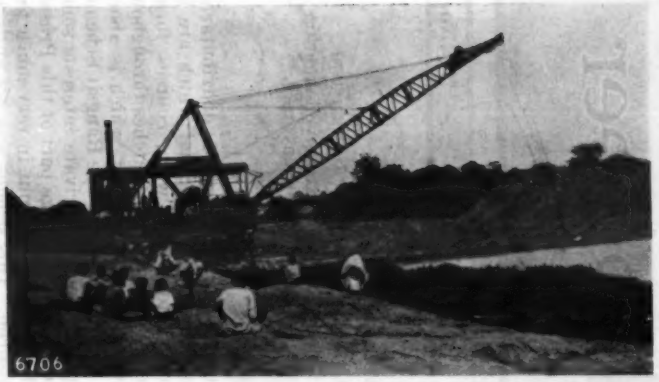
The canals which form the lateral bars of the gridiron in the Rangsit System are about 3-1/5 kilometers apart, and the present plan is to run a high level canal between each of these bars and parallelling them for their total length, which averages 20 kilometers.

This new water brought in from the Prasak River will be run into the high level canals. The water will reach these canals at a level somewhat above the surrounding ground surface, and will be distributed by means of control gates and ditches over the land on either side. Likewise it will be drained off when desired to the drainage canals.

Application of Excavating Machinery

Practically all the large canals in the East have been excavated entirely by hand, but in planning this work Mr. Wilson decided, owing to the increased cost of labor, that it would be ad-

The Class-175 Bucyrus shortly after it started work. 79 buckets were taken out in an hour within one week of it being erected.



Another view of the Class-175 at work. Note the audience.

Dragline excavators in action. Bucyrus Class-20 in foreground carries a 70-foot boom and 2½-yard bucket. Bucyrus Class-175 in background with a 90-foot boom and a 6-yard bucket.

Part of Main Canal Near Dha Lusng

Excavation Operations on the Prasak Canal Project, Siam

visable to do as much of the work as possible with machinery. To this end was purchased one Bucyrus Class-175 dragline excavator, and a 12-inch Bucyrus suction dredge, also one Marion dragline Model 251. These machines were put to work about November 1916 with results so satisfactory that another order was placed with the Bucyrus Company for one Class-20 and one Class-24 dragline and a 16-inch suction dredge.

Both the Marion and Bucyrus Companys sent, with the first order, a representative to see that their machines were properly erected and started. Mr. J. B. Harmon represented the Marion Company and Mr. Chas. E. King, the Bucyrus Company. Mr. Harmon erected and started the Marion machine and then returned to America. As the Royal Irrigation Department had no mechanic available for this field work at this time, Mr. King was retained in charge of the machines and served in that capacity until August 1918, when the writer arrived from America and took charge as Mechanical Engineer of Construction.

The work on this main canal was divided into two divisions, known as the Headworks and Main Line Divisions.

The amount of excavation for all four machines during April, 1921 was 129,241 cubic meters. The amount of excavation for the whole of the Main Line to the end of April was 3,588,528 cubic meters.*

General Plan of Prasak Headworks

As there are no roads in the district where this excavation was done, it was necessary for the department to build a small railway parallelling the line of excavation, for the purpose of delivering firewood and other supplies. This road was a 24-inch gauge about 23 k. m. in length, and we had in use one Davenport locomotive and about 125 one-yard dump cars and a second locomotive of German origin, which was purchased locally. The larger part of the costs of maintaining this railroad and equipment was borne by the draglines.

The Fuel and Water Problems

As regards fuel, both wood and crude oil was used. When the machines started in 1916 the cost rate per cubic meter of excavation was almost the same with either fuel. Throughout the work the cost of both these fuels steadily rose, but the oil rose at a faster rate than the wood fuel, consequently all the machines were put on the wood. Then owing to changes in the administration of railways in Siam, all the wood contracts fell through, and it was necessary to revert entirely to crude oil, at almost 100% more than we paid originally. Then later, when there was a further rise in the price of oil, the machines were put back on wood.

These numerous changes, due to causes which the Department could not control, added materially to the working costs. The supply of water to the machines was a constant source of anxiety. During the dry season from January to June, except for small holes in which water is retained by the villagers for themselves and their cattle, there is not a drop of water to be had nearer than the Prasak River. The plan adopted was to use the completed excavations behind the machines as reservoirs, the filling being done during the monsoons, when water was plentiful. The plan adopted worked well, provided there was sufficient rainfall, but following a rather dry monsoon season, owing to the alkaline deposits contained in the newly opened subsoil, the water became absolutely unfit to use for boiler purposes, especially as the machines moved farther from the river. The water had then to be pumped either from the headreaches of the canal where the alkali was not as marked, or from the Prasak River itself, more than 30 K. M. distant.

The water supply was a very expensive item.

The Labor Problem

It was, of course, the policy of the Government here to use as far as possible the local labor, which consists of the native Siamese and a sprinkling of Chinese. Most of these men had never worked around machinery of any kind, and none had any experience with this type of excavator.

To start the machines two operators were brought from America and two more Europeans

*In an article by Percy H. Lee, Superintendent on the Project in the "Pioneer", the following maximum monthly outputs for the Bucyrus dragline excavators were given:

Class - 175	67,600 cubic yards
Class - 24	55,600 cubic yards
Class - 20	50,000 cubic yards

The average monthly outputs over a period of three to five years are as follows:

Class - 175	36,100 cubic yards
Class - 24	25,900 cubic yards
Class - 20	23,200 cubic yards

These averages include the output of those months in which progress was handicapped by inexperienced native operators, impure water supply and other causes such as shortage of cables and fuel. The class of material was good hard clay. The theoretical working day was two 9-hour shifts.

were hired locally. These men were allowed to return as soon as their contracts expired, except one of these hired here, Mr. Addison, a British subject. The places of these retiring operators were filled with Siamese and Chinese. As was to be expected they could not handle the machines

Main barrage gates nearing completion. The ballast boxes which show just below the upper bridge floor weigh 84 tons each.

as efficiently as experienced men at home. However, it seems that the Europeans who follow this line of work also cease to be efficient after a short period in the tropics.

The Headworks Division

In laying out the Headworks, advantage was taken of a horseshoe bend in the river (see accompanying sketch), by cutting a new river channel across at the narrowest point, which happened to be about the place representing the heel of the horseshoe.

About midway of this channel is located the barrage for control of the river, and immediately up stream from this the main canal branches off at an angle of 90°. The head of the main canal carries a regulator, and the masonry of this is integral with that of the river barrage.

The river barrage contains six sluice gates, 44 feet 1⅞ inches wide by 24 feet 7½ inches high,

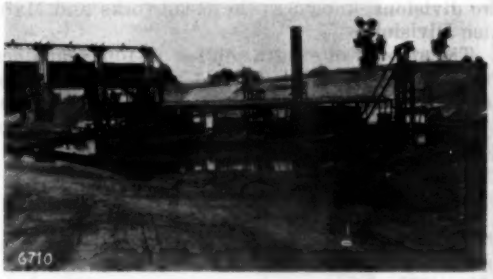
Main Canal Regulator

with a lift of 34 feet. These gates are of the Stony type built by Glenfield-Kennedy & Co. of Kilmarnook, Scotland, as was also the lifting mechanism for their control.

The main canal regulator carries eight sluice gates, each 15 feet wide by 12 feet high, with a lift of 11 feet 9 inches, also of the Stony type. The lifting mechanism for these was also built by Glenfield, Kennedy & Co., but the gates were built by the Irrigation Department in their Bangkok Shop.

The pit excavated for the barrage masonry, about 150,000 cubic meters, was taken out partly by hand and partly by a Bucyrus 70-Ton shovel.

This shovel has a history of its own. It was imported into Siam via Europe in 1905, for use in the Luang Suan tin mine in the Malay Peninsula. After being used for the excavation of about 5,000 cubic meters of overburden, the Tin Company went into liquidation, and the shovel was abandoned, together with the mine. This mining property eventually reverted to the Government, and in 1917 the Department salvaged the shovel and put it to work on the barrage pit. Except for the boiler, of which most of the tubes were rusted out, the machine was in perfect condition. A second-hand boiler was provided for the shovel, and later the old steam shovel boiler was repaired and put in service running a 24-inch pumping engine.



12" Bucyrus suction dredge on same work. Note main barrage gates in background.

Hydraulic Dredge Operation

The two Bucyrus suction dredges were utilized for making the new river channel on the upper and lower sides of the barrage.

The banks along this channel at low water stage are more than 10 M. above the water level, and are composed of a very hard yellow clay. This clay proved very difficult to work with the suction type dredge, presenting a face almost vertical, and at times refusing to break down until undercut to a distance of 3 or 4 feet. This somewhat endangered the dredge by breaking down in large cakes weighing many tons. We had one accident from falling earth that bent the ladder and agitator shaft of the 12-inch dredge, causing a couple of weeks delay. We lessened the danger some by blasting the ground ahead of the dredge, but owing to Government restrictions here, it is very difficult to obtain powder even for a Government Department, so a part of the time we were unable to blast because of this fact.

16" Bucyrus hydraulic or suction dredge making the new river channel near the barrage. See sketch, page 81.

The spoil was piped for the most part a distance of 500 or 600 feet and some of it elevated to a height of 25 feet.

Contract Work

There are several regulators and navigation locks on the system, also two large syphons for carrying natural waterways under the canal. Part of this syphon work was let out on contract which has not proved very satisfactory. This contract was the only one let during the whole course of the work, the usual method being for the whole work to be done departmentally, a Chinese contractor being employed merely as a labor agent to supply the labor. The Department assumed sole responsibility for the work from start to finish.

The work was so well planned that the different parts all approached completion at practically the same time, and but for the failure of the contractor on the syphon work would have been ready to irrigate the 1921 rice crop.

Mining Lignite in North Dakota

Description of the Truax Coal Company's Operations, the Largest Strip Mine in North Dakota

THE lignite district of North Dakota lies, for the most part, not far from the Canadian border in Burke County in the northwestern portion of that state.

Five miles south of the town of Columbus in that county, the Truax Coal Company operates a strip property, which is not only the biggest in tonnage but the most up to date in equipment in that state. In the year 1922 this progressive outfit shipped upwards of 3000 carloads of lignite coal over the Great Northern Railroad into the northern half of North Dakota and western Minnesota.

The property consists of 480 acres of ground, with a vein 9 feet to 10 feet deep, covered by an overburden running from 10 feet to 30 feet deep.

The lignite is hauled from the mine over five miles of line owned by Truax, Whittier & Truax to Kinkaid on the Great Northern where this combination of lignite producers have transfer tracks with a capacity of eighty cars.

Digging Equipment

The heavy artillery of the mine consists of a 175-B Bucyrus revolving shovel which carries a 3½-cubic-yard dipper and a 75-foot boom. This

View showing part of the Truax Coal Company's operations. The Bucyrus 175-B has pulled away from the smaller shovel and is returning on another cut on the opposite side of the property.

Train Load of Coal on Its Way to the Tipple

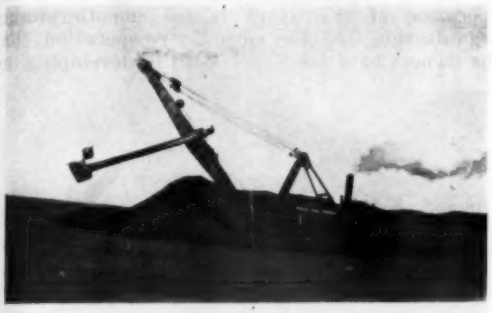
View of old pit. Teams and sleds hauling lignite to tipple.

The 35-B Bucyrus loading lignite. Cars on the way to the tipple.

Loaded cars going up to tipple. Empties coming down to shovel.

machine is used to strip the overburden from the lignite deposit. During the past year it has been carrying a cut which has averaged 60 feet wide and from 18 feet to 30 feet deep.

The usual coal-stripping methods are followed. The 175-B is followed by a 35-B Bucyrus revolving shovel on caterpillars with a 1½-yard dipper, a 30-foot boom and a 19-foot handle, which digs the coal which the 175-B has uncovered.



The 175-B Bucyrus Opening Up an Extension to the Old Pit

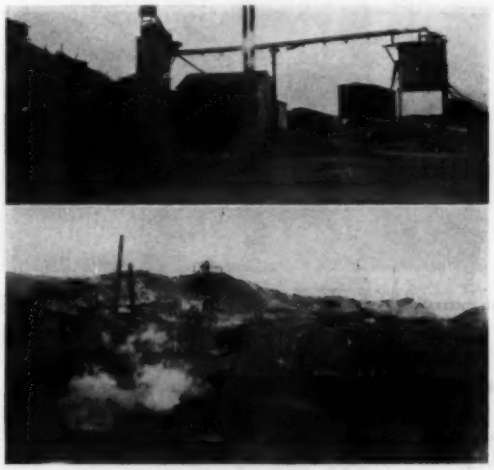
The big shovel casts the overburden over into the pit from which the smaller shovel has taken the coal on the previous cut.

The 175-B as a rule works one 12-hour shift. No attempt is made to force operations, but a steady output of 3000 cubic yards per day is maintained when working full time. The overburden consists of a soft blue soapstone next to the coal, topped by a strata of yellow clay. In 1922 this shovel disposed of 400,000 cubic yards of overburden.

Mining the Lignite

The 35-B shovel operates a 10-hour shift and handles an average of 1200 tons in this period when operating steadily.

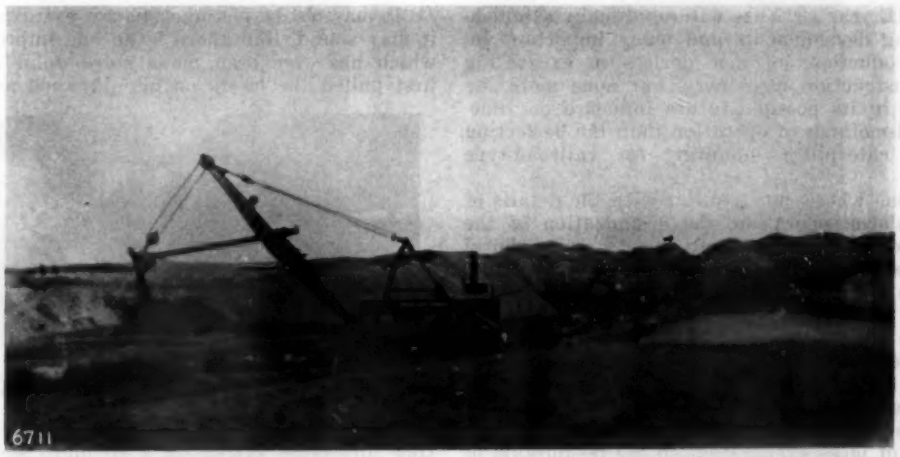
The lignite is loaded into three-ton, home-built, side-dump cars. The company has 40 of these



Upper view, old tipple in operation; lower view, the new tipple with steam dump shaking screen and automatic switch. A train of loaded cars is constantly on its way to the tipple and a train of empties returning to the pit.

cars, which as a rule are made up into four 8-car trains, which are handled by three 14-ton locomotives, two Porters and one Vulcan. The haul to the tipple varies between 800 feet and ¾ of a mile.

At the tipple the lignite is dumped into a shaking screen which extracts the lump, this



View Showing the Bucyrus 175-B Closely Followed by the 35-B, the Former Stripping and Casting Over into an Old Pit and the Latter Loading Coal

passes off the screen into an Ottumwa box car loader. The screenings are re-screened from ¼ inch to 1 inch. This is elevated 30 feet, where it is put through a roller screen, the dust being carried to the waste bank by a conveyor, and the nut through spouts to box cars below.

An interesting view of the pit showing the lignite and the overburden. The overburden here is 18 feet and the coal 12 feet.

Two men on the tipple can handle 1200 tons in ten hours.

Water in the pit does not offer such a serious problem as in bituminous coal stripping. It is disposed of, however, by means of Fairbanks-Morse centrifugal pumps driven by gasoline, which pump it over the waste bank, a distance averaging about 100 feet.

The shovels and locomotives, of course, burn lignite. To adapt them to this fuel both are equipped with 25% oversize boilers. The big shovel burns about 22 tons in 12 hours.

The lignite is of excellent quality. The following are the results of the analysis and tests made by the College of Mining Engineering, University of North Dakota, from samples submitted:

Volatile Matter	47.24
Fixed Carbon	44.76
Ash	8.00
Sulphur	.76
British Thermal Units	10,573

One of the most noticeable things about the operation of this plant is the smooth-running organization and the splendid co-operation that the owners have been successful in developing, by building up a personnel, of which every member takes an active interest in his work and his company.

The 175-B stripping. An idea of the size of the waste pile can be gained from the figure of the man.

Mr. E. M. Truax is President of the Company, J. S. Greenup, Vice-President, and A. H. Truax, Secretary and Treasurer.

Caterpillars for Railroad-Type Shovels

A Survey of the Development of This Mounting During the Past Year

THE year 1922 has witnessed many astonishing developments and many important introductions of new devices in excavating and construction machinery, but none more important in its possible future influence on time-honored methods of operation than the perfecting of the caterpillar mounting for railroad-type shovels.

To one who is not familiar with the details of steam shovel operation, the organization of the pit crew and the daily routine on a steam shovel job, this statement may not register as it should. It sings a different tune, however, to those of our readers who know the meaning of the steam shovel's whistle, when it has reached the end of its move, and the operator is calling his pit crew to the laborious task of shifting the track sections, releasing the jacks, setting the rail clamps, watching the heavy shovel roll up, and the re-setting of jacks preparatory to the resumption of digging.

It may not be too much to say, extravagant as it may sound, that there is no one improvement which has ever been made since John Souther first pulled the levers on his old wood and steel "mill" over 84 years ago that will mean more in time and labor saving on a standard shovel job than this.

An 88-C Bucyrus Shovel Mounted on Bucyrus Caterpillars in the Plant of the Atlas Portland Cement Company at Hannibal, Missouri

Model 91 Marion shovel on Bucyrus caterpillars, Oliver Iron Mining Company. This company has just purchased 10 more sets for use under its shovels.

Model 91 Marion Shovel on Bucyrus Caterpillars in the Plants of the Kelly Island Lime and Transport Company, Marblehead, Ohio

Another View of the Kelly Island Installation

70-C Bucyrus Shovel on Caterpillars on the Castleton Cutoff, New York Central, South of Albany, New York; S. A. Smith, Contractor

Four Views Showing Railroad-type Caterpillar Installations

The first set of caterpillars under a railroad-type shovel were supplied by the Bucyrus Company for a Marion Model 91 owned by the Kelly Island Lime and Transport Company in their quarry at Marblehead, Ohio, in February, 1922.

This installation was immediately successful and was closely followed by a large number of others built by the same company. The list is so impressive in view of the variety of installations that we are giving below the names of the companies who have purchased them and the types of shovels under which they will be or are installed:

Name of Company	Number and Type of Shovels
Kelly Island Lime and Transport Company	1 Marion Model 91.
S. A. Smith	1 Bucyrus 70-C.
Oliver Iron Mining Company	11 Marion Model 91.
Palmer & McBryde	1 Bucyrus 60-C. Electric
Utah Copper Company	7 { Bucyrus 95-C. / Marion Model 91.
Atlas Portland Cement Co.	1 Bucyrus 88-C.
A. E. Dick	2 Bucyrus 70-C.
Trafikaktiebolaget—Oxelosund, Sweden	1 Bucyrus 100-C.
Central Pennsylvania Quarry, Stripping and Construction Co.	1 Marion Model 61.
Locust Mountain Coal Company	1 Bucyrus 70-C.
France Stone Co.	2 { Marion Model 92. / Bucyrus 95-C.
Chile Exploration Co., Chile	1 Bucyrus 103-C. Electric.
Michigan Limestone and Chemical Co.	1 Marion Model 100.
Sandusky Portland Cement Co.	1 Bucyrus 68-C. Electric.
Kandos Portland Cement Co., Australia	1 Bucyrus 68-C. Electric.
Duquesne Slag Company	1 Bucyrus 103-C.
Marquette Ore Company	1 Bucyrus 88-C.
States Corporation, Chicago, Ill.	2 { Bucyrus 88-C. / Bucyrus 103-C.

This mounting is undoubtedly familiar to most of our readers. It consists, in general, of two forward caterpillars replacing the jack arms,

Model 91 Marion Owned by the Utah Copper Company, Mounted on Bucyrus Caterpillars

so designed that they can swivel and adjust themselves to the unevenness of the ground, and two rear caterpillars mounted on one frame under the rear end of the shovel.

The propelling power is considerably greater than a shovel mounted on railroad trucks, being sufficient to enable the shovel to climb with ease grades up to 20%.

The treads are of cast steel of very heavy construction, different sizes being offered to suit the character of the ground on which the shovel is to operate.

One of the Forward Caterpillars from the Front, Kelly Island Lime and Transport Company

The advantages of this style of mounting can be appreciated at a glance by old shovel men. It is, of course, evident that the time and labor-saving elements are tremendous. The extent thereof varies considerably with the character of the work the shovel is doing.

The track sections, of course, are discarded, and there being no jacks to release and set the need of a large pit crew is completely eliminated, which is an enormous item in itself, especially when the present labor shortage is considered.

The time of moving up is also practically eliminated, as the shovel can move up while the dipper is swinging back from the car. As the time thus consumed always enters into the cost figures of any operator in a no small degree, this is an item of saving which mounts up considerably at the end of a day's work.

The shovel, furthermore, can always be kept at the most effective digging distance from the face of the cut. There is no need of reaching out to get a full dipper, this means less strain on the boom and handle and a possibility for greater output, especially in heavy digging. The operator does not have to worry about track troubles when the pit is wet. In rock excavation, the shovel is not obliged to face blasts with the attendant likelihood of heavy repair bills, because it is but a few minutes' time to move back out of the way and up again when the shot is over.

There are many other advantages which only

become apparent after time has revealed them, such as the ability in emergencies, such as slides, of moving quickly out of danger, the ability to turn easily, and, what must not be overlooked, the extraordinary lack of fatiguing vibration noticeable. It has been found that this lack of vibration also has an effect of increasing the life of the piping on the shovel.

As to the actual saving of a caterpillar mounted shovel over one mounted on railroad trucks, conditions differ so greatly that it is difficult to give figures that hold true in all cases. It has been estimated, however, by field test that the saving per 8-hour shift in labor and tracks alone is between $25 and $30 with a 10% increase in output.

One of Forward Caterpillars from Rear, Oliver Iron Mining Company

The mounting of heavy excavating machinery on caterpillars is not a new or untried experiment. The Bucyrus Company has, indeed, in the past eight or nine years mounted well over one hundred dragline excavators, revolving shovels and tower excavators, weighing between 65 and 220 tons, in this manner with unqualified success. The adoption of this device to the railroad-type shovel is just another step in the remarkably rapid improvement in excavating machinery so apparent in the last few years.

Perhaps the most striking testimonial to their success is the thorough investigation and tests made by two of the largest users of railroad-type steam shovels in the world today, the Oliver Iron Mining Company and the Utah Copper Company, whose recent enormous purchases are mentioned elsewhere in this issue.

Both of these companies purchased one set of caterpillars which were installed under one of their shovels. After a long and rigorous test the success of this mounting and the enormous saving involved was sufficiently proven to justify the purchase of ten additional sets by the former and six by the latter.

Keep your eyes on this development, it has only just begun.

Oliver Iron Mining Company and Utah Copper Company Place Large Heavy Equipment Orders

Nothing can be more indicative of the rosy prospects of increased activity in the mining industry than the tremendous equipment orders placed lately by the Oliver Iron Mining Company and the Utah Copper Company.

Anticipating an increased production of ore during the forthcoming season, the Oliver Iron Mining Company has purchased equipment consisting of one 300-ton revolving steam shovel, one hundred 3-yard, all-steel, air-operated dump cars, three 50-ton revolving shovels mounted on caterpillars, ten caterpillar mountings for standard railroad type shovels, two air-operated spreader plows, ten 50-ton all-steel, standard gauge flat cars, twelve 8-wheel switching locomotives and two locomotive cranes.

Large Revolving Shovel

The 300-ton shovel order was placed with the Bucyrus Company. This shovel will be similar to the 225-B Bucyrus shovel now in operation on the Range, except that it will be considerably heavier and more rugged than any revolving shovel now in service, in order to meet the particularly rigorous service which is encountered in the Lake Superior district. The outstanding new features of this shovel are as follows:

The rails upon which the shovel swings will be 175-lb. section as rolled by the Lorain Steel Company.

All split bearings throughout the shovel will have removable babbitt-lined brass shells in the boxes with cast steel babbitted caps held down with through bolts. No stud bolts will be used.

All engines will have piston valves for using superheated steam, and the lubrication will be effected by six-feed force feed lubricators. The size of the engines has not been increased.

The capacity of the steam boiler has been increased 35 per cent, and the boiler is to be equipped with Franklin air-operated firing doors and the DuPont type of locomotive stoker. A twenty-ton steel coal bunker, designed to feed coal by gravity to the stoker, will be provided. The boiler will be designed for 150 lbs. pressure and 550 degrees total temperature.

The shovel will also be provided with a jib crane having a capacity of hoisting ten thousand pounds of coal and placing same in the top of the coal bunker.

Within the frame of the shovel housing, which is to be of 1¾-inch wood paneling attached to a structural steel framework, will be placed two crane rails carrying a hand crane mounting, a trolley which will give access to any part of the machinery within the housing. The location of the jib crane is so arranged that repair parts can be lifted from the ground and placed beneath the trolley of the main crane.

(Continued on Page 92)

These views show an interesting pa of w
Callaway Company of Atlanta for th stat

The photograph to the right illustra a 60
proach to a tunnel through very hard ock,
in order to permit the shovel to ge e
Western dump cars hauled by 20-to aver
drills is supplied by an air compress

A view of the mouth of the tunnel ows
is 580 feet long and through hard r An
4-yard cars in close quarters.

We are indebted to A. S. Dickson, ma ger of
He tells us his shovel is strong and l s ha

These photographs were taken on the Union Pacific Double Track Work near Evanston, Wyoming, in the spring of 1921. It will be remembered that the Utah Construction Company had the general contract, the Christensen Construction Company having a subcontract for the Bear River Change, which they did with a Class-14 Bucyrus dragline.

Leo Dohoney, who operated the machine, has sent us the views. He tells us he cut a 100-foot channel, taking an 80-foot channel in one cut to a depth of 5 to 6 feet, then coming down one side with a 20-foot cut, casting the material over alongside the railroad to fill up the old channel.

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...ing ...of work carried on by the Brooks-...or the ...state Railroad in Coeburn, Virginia.

...illustrates a 60-C Bucyrus excavating an ap-...r hard ...ale, which is shot ahead of the shovel ...to g...e hold. The shovel loads 4-yard ...20-t...venport locomotives. Air for the ...press...

...nnel ...own in our other view. This tunnel ...ard r... An Osgood 18 may be seen loading ...

...n, ...e of the 60-C, for these photographs, ...and ...l handles the rock with no trouble.

P. A. Chapman's Class-9½ Bucyrus gasoline dragline engaged in road construction near Clarksville, Texas. The machine is shown working through wet, swampy country, taking material from both sides to build a 30-foot crown.

The center view shows one of the teams and "mud boats" used to get supplies up to the work; on the bottom, the method of moving the patoons on which the machine travels. The views were sent us by Mr. J. L. McAlester of that firm.

The shovel will also have an auxiliary electric dipper trip which will permit operation of the shovel by the runner alone in cases of emergency.

The auxiliary equipment of the shovel will consist of a 10½-inch C. C. Westinghouse air compressor, two 2 KW turbo-generators for lighting and power, and steam injectors for boiler feeding.

The shovel will be purchased with a manganese steel interchangeable seven-yard Misabe type dipper and spare dipper stick.

The shovel has been re-designed in most of its minor details, and it is thought by both the manufacturers and the Mining Company that the shovel will be greatly superior to the present equipment of the heavy rolling class, and it is believed that the unit repair cost per yard of material handled will be very materially lessened.

Small Revolving Shovels

The three small revolving shovels are 50-B Bucyrus, mounted on caterpillars and equipped with 1½-yard dippers. These shovels are the modern development of the 35-B Bucyrus shovels now in use on the Range.

Caterpillar Mounting for Railroad-Type Shovel Has Proved a Success

Perhaps the most interesting part of this order, when considered in the light of the most recent development in economic methods of shovel operation, are the ten sets of caterpillar mountings ordered from the Bucyrus Company to be installed under railroad-type shovels now in service.

This order followed a long and severe test given a set of caterpillars purchased from the Bucyrus Company some months ago and installed under a Marion shovel. This test proved so successful, and gave positive assurance of such enormous economies, that the Oliver engineers requisitioned ten additional mountings.

These new caterpillars will be furnished with a direct shaft and gear type of steer to the rear caterpillars.

New Spreader Plows

Based on the successful operation of the Class-50, all-steel, air-operated spreader plow which has been in service on the Range for the past two years under the most severe conditions, an order was placed with the Bucyrus Company for two duplicates which will be used for spreading on the dumps. These plows have a far greater spreading capacity and are much heavier and stronger than any other type heretofore used.

Large Dump Car Order

The order for one hundred 30-yard dump cars was placed with the Western Wheeled Scraper Company. This, as far as we know, is the largest dump car order ever placed for use in this country. The cars will be somewhat heavier than those now in service. They will be equipped with two 20-inch dump cylinders on each side of the center sill, which will be operated by compressed air furnished by the locomotive.

Other Orders

In addition to this, the Oliver Iron Mining Company purchased ten 40-foot, 50-ton, all-steel, under-frame flat cars from the Mount Vernon Car Manufacturing Company, twelve 8-wheel locomotives weighing 215,000 pounds each, equipped with superheaters and automatic stokers, and two Industrial locomotive cranes from Philip T. King of New York. These cranes are heavier than any previously used in this mining region and have a greater lifting capacity.

All of the above apparatus will be equipped with the most modern and efficient safeguards and safety appliances that can be practically attached or installed during construction of the apparatus. All of this equipment is ordered for early spring delivery, and is to be distributed among the mines of the Oliver Iron Mining Company on the Mesabi Iron Range of Minnesota.

Utah Copper Company Places Large Order

At practically the same time the Utah Copper Company placed a very large order which contemplates the gradual electrification of their mines.

One of the most interesting features of this order, however, is six caterpillar mountings for their steam shovels, which order was, as in the case with the Oliver Iron Mining Company, placed with the Bucyrus Company after a long and thorough test of one set previously ordered.

Nicaraguan Canal Project Comes to Life

According to recent newspaper reports, it is indicated that Congress is definitely considering the resurrection of the century-old plans for the Nicaragua Canal.

There is no hint from Congress why a project so long considered passe has again been dragged into the spotlight, but Panama has been questioning some rights of the United States in the Canal Zone. The business of the canal has been prospering, but the locks are too small for the larger liners and may soon be overcrowded by the small craft seeking passage.

A short time ago, President Harding expressed his hopes that profits from the Panama Canal Zone would ultimately enable the United States to build another waterway between the oceans and a protocol was signed with Costa Rica which clears away the last serious diplomatic obstacle to the Nicaragua Route.

The Nicaraguan Canal was proposed over a hundred years ago and even started, only to be abandoned when the Panama route was suggested.

Estimates on this proposal, prepared twenty years ago, gave the total cost as $190,000,000 and it is believed probable that these could be redrafted with allowances for material costs, labor and construction machinery in a way that would give a rough estimate for such a project under present-day conditions.

Specifications on which the original estimates were based called for a waterway of 35 feet deep and 150 feet wide at the bottom.

These estimates are being used at the present time as a basis for the discussion of the project.

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THE EXCAVATING ENGINEER PUBLISHING CO.

Bradlee Van Brunt, Manager and Editor

South Milwaukee, Wisconsin

Printed in the U. S. A.

Rising Costs of Operation vs. Modern Methods

Elsewhere in this issue there are two articles that we feel deserve more than passing notice, not so much because of the subject matter thereof but because they offer such pertinent examples of the modern trend towards better business efficiency.

The practice of business efficiency does not alone find a fertile field in our great industrial plants and our various governmental organizations but it finds an equally fertile soil at this particular time in our mines, quarries, brick plants and construction undertakings large and small wherever heavy machinery is used. Two conditions in particular are now forcing this situation to the attention of consumers and manufacturers.

One, of course, is the rising price of coal and the scarcity thereof, and the other is the increasing scarcity of common labor. Neither of these two conditions need further comment. They are obvious on every hand. Both, of course, exercise their influence in forcing upward the cost of production. To the up-to-date contractor and the producer, however, they present new opportunities of underbidding and underselling through improved methods and machinery. If there ever was a time when it behooved the contractor and the producer to study new methods and investigate new machines and devices *now* is the time.

We mention the fact that two articles in this issue are worthy of more than passing notice as pertinent examples of the modern trend of business efficiency. These examples are interesting as they illustrate how some are setting the pace to this end which others will sooner or later be obliged to follow.

In these particular instances the step taken to offset this increased cost of operation was in the application of caterpillar mounting to railroad-type shovels. We do not intend here to go into the details of the extraordinary increase in efficiency and economy made possible by this new device, as this is thoroughly treated in these articles, but we do desire to point out that one firm after testing this mounting under one of their shovels for a sufficient period to enable them to arrive at a clear estimate of its future worth, proceeded to invest considerably over $100,000 in their confidence that this investment would accomplish just what they wanted: namely, a lower cost of operation and a higher efficiency of operation.

We must get away from the tendency to shy at a high first cost, we must look farther ahead, if we are to compete on better terms than our neighbors. This same end in view may be seen in the tendency to purchase heavier and more expensive dump cars, cranes, concrete mixers and machinery that produce more and longer at a lower cost of operation.

But we haven't yet mentioned the fuel problem. During the last year or so we have seen this situation as the mother of many remarkable developments, the superheater, the gasoline engine, and lastly and perhaps the most remarkable of all the successful application of the Diesel-type engine to excavating machinery. The superheater has brought astonishing results under test, both when applied to locomotives and steam shovels. The gasoline engine is literally sweeping the country. We find it being applied to every conceivable form of machinery at an ever increasing rate.

About the last to come in line was the revolving shovel, which offered a knotty problem in the solution of the transmission of the power to the thrust. This has been worked out, however, in the perfection of the so-called "rope thrust" shovel, which has proven to be even more effective in its operation than the tried and trusty steam machine.

The Diesel oil shovel and dragline, however, is the latest move of the manufacturer in his battle with fuel cost. The fuel economy reported is so tremendous as to be almost unbelievable. One Pacific coast contractor actually reports that his fuel bill is paid by the first two dippers of earth each day. Here again the first cost may appear as an obstacle to many, but in this new phase of industrial development he who underbids his competitor consistently or produces more at a lower cost will do so not by economizing on the first cost of a new device but by realizing where that greater economy lies, which will put him one step ahead of the rest of the world.

· FIELD NOTES ·

Instructions on Care and Maintenance of Excavating Machinery

This is the fifth of a series of articles which we intend to publish on the care and maintenance of excavating machinery. It is intended primarily for the man on the job, and we would be very pleased indeed to receive any comments, suggestions or criticisms which any experienced shovel or dragline operator might care to make.

Boiler Feed Water

Boiler feed water trouble primarily is a matter for a chemist to handle and not an engineer or an operator. Although a great amount of information is available, the best advice which can be given to an operator is to report his troubles to his superintendent with the request that a sample of the water be taken and submitted to some good chemist or chemical company for analyzation and recommendation.

Four terms commonly mentioned but not generally thoroughly understood by the average operator, are:

Scale—Scale is formed on boiler heating surfaces by deposit of impurities in the feed water in the form of more or less hard adherent crust. Such deposits are due to the fact that the water loses its soluble power at high temperatures or because the concentration becomes so high due to evaporation that the impurities crystalize and adhere to the boiler surfaces. Earthy impurities such as lime in water cannot be evaporated off but will remain in the boiler and adhere to the heating surfaces almost in the proportion to the heat or evaporation of that surface.

Foaming—Foaming, which ordinarily occurs with water contaminated with sewerage, lubricating oil, or organic growths, is due to the fact that the suspended particles collect on the surface of the water in the boiler and render difficult the liberation of steam bubbles rising to the surface.

Foaming is largely overcome by filtration or by the use of coagulant in connection with filtration.

Priming—Priming or passing off of steam and water from the boiler in belches is caused generally by the concentration of sodium carbonate and sodium phosphate or sodium chloride in solution. Sodium phosphate is found in many Southern waters, also where calcium or magnesia sulphate is precipitated with soda ash.

The patented scale chamber, such as is furnished in boilers on Bucyrus machines, assists in the prevention of the above feed water troubles.

Furthermore it has been found that the installation of a set of properly arranged patented baffle plates assists in the prevention of priming. This installation is considerably cheaper than a steam separator of the receiver type which is sometimes used for the prevention of priming. These baffle plates or dome type steam separators are furnished on request.

Priming is sometimes overcome by frequent blowing down of the boiler. However, if the boiler primes so badly that the excessive blowing down results in excessive losses of steam, then one of two things must be done: *First,* purify the water by chemically treating it or by the evaporation method; or *second,* obtain better water from some other sources.

Corrosion—Where there is a corrosive or chemical action leading to the actual destruction of the boiler metal due to solvent or oxidizing properties of the feed water, it may sometimes be overcome by the neutralization of the water by means of carbonate of soda or by the use of a high grade of hydro carbon oil.

The next common method of treatment of feed water is the use of some of the so-called boiler compounds. There are many reliable concerns handling such compounds, which unquestionably give results, but there is a tendency to look upon a compound as a "cure-all" for water difficulties. Care should be taken to deal with only reputable concerns. When proper care is taken to suit the compound to the water in use the results secured are fairly effective.

The fact cannot be emphasized too strongly that it is most advisable to take your feed water troubles to your superintendent with the request for expert chemical advice.

There is but one way to get the full value of a machine and that is to keep it in good repair, clean and well oiled. Nothing ruins machinery like neglect. Did it ever occur to you that you are not getting either the full quota of work from your machinery, or the best quality? Of course it is unwise to crowd a machine, but many a machine that is doing poor work, and perhaps little work, might be made to give better service, if well taken care of.

Machinery may be automatic; but there is no machine that will take absolute care of itself. They respond to neglect and attention almost like sentient beings.

To get a gear wheel off a shaft, upon which it has been shrunk, take it to the foundry or shop and pour some melted iron around the hub, and it will heat and expand so quickly there will be no time for the shaft to get hot, and the gear will come off easily.

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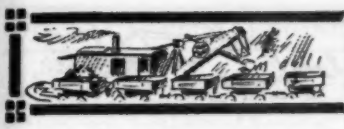

DEVICES YOU OUGHT · TO KNOW ABOUT ·

New Line of Small Vertical Belt-Driven Air Compressors

The Ingersoll-Rand Company, 11 Broadway, New York, have recently announced a new line of small vertical belt-driven air compressors known as Type Fifteen. In addition to the plain belt-drive design (Fig. 1) each size is built as a self-contained electric motor outfit, driven through pinion and internal gears as shown in Fig. 2, or by employing the short belt-drive arrangement. The compressing end and electric motor of both gear and short belt-drive units are furnished mounted on a common sub-base, so that they are in no way dependent upon the foundation for correct alignment.

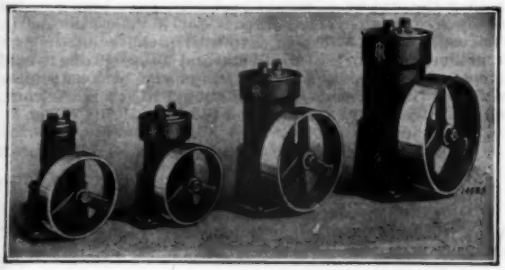

Fig. 1—The Family of Type Fifteen Vertical Belt-Driven Air Compressors showing the 3-inch by 3-inch Air Cooled, the 3½-inch by 4½-inch and 4½-inch by 5-inch Water Reservoir Cooled Machines, Manufactured by the Ingersoll-Rand Company

Several noteworthy features of construction have been incorporated, of which the "Constant-Level" Lubrication System is the most important. Others include the Constant Speed Unloader for plain belt-drive machines; the Centrifugal Unloader for start and stop control machines; and the increased size of the water reservoir cooling pot.

The lubrication of small vertical compressors employing the enclosed crank case and splash system has often been a source of concern wherever oil in the air is a serious menace. The tendency of the old system has been to feed too much, resulting in discharged air containing excess oil, or too little causing scored cylinders, excess loads and burned-out bearings.

The "Constant-Level" system used in Type Fifteen Compressors automatically maintains a constant-level of oil, which insures the right amount being distributed to all parts.

As with the ordinary splash system, the base of the compressor forms an oil reservoir for the "Constant-Level" System. However, with this system, pet cocks determine the maximum and minimum amount of oil in the reservoir. Above this reservoir and directly underneath the connecting rod is a constant-level pan. Oil is pumped from the reservoir into this constant-level pan through a unique oil pump. Regardless of the amount of oil in the reservoir, so long as it is somewhere between the high and low level pet cocks, this system will function perfectly, insuring a constant-level of oil in the pan. A projecting stem on the connecting rod dips into this pan and distributes just a sufficient quantity of oil for proper lubrication.

The Constant Speed Unloader controls the unloading of the compressor by automatically opening the inlet valve when the received pressure rises above that at which the unloader is set to operate. When the receiver pressure has fallen a predetermined amount, the unloader automatically releases the inlet valve and allows the compressor to return to work and thus build up the receiver pressure again.

The Centrifugal Unloader allows the compressor to start under "no load" such as is essential when automatic start and stop control is used, and permits the electric driving motor to come up to full speed before the load is thrown on automatically. This unloader accomplishes its purpose by holding the inlet valve open until the motor has reached full speed.

Fig. 2—The Family of Type Fifteen Vertical Electric Gear-Driven Air Compressor showing the 3-inch by 3-inch Air Cooled, the 3-inch by 3-inch, 3½-inch by 4-inch and 4½-inch by 5-inch Water Reservoir Cooled Machine, Manufactured by the Ingersoll-Rand Company

The smallest size is built with either ribbed cylinder for air cooling, where the service is intermittent, or a water jacketed cylinder of the reservoir type for constant service. All other sizes are only built with the water jacket of the reservoir type. The size of these reservoir pots is very generous, and one filling will be found sufficient for long periods of operation.

A descriptive bulletin has been issued on these compressors which describes in detail all their features including others not mentioned above. Copy can be secured by writing the above address.

SHOTS FROM THE FIRING LINE

Central States News

BY J. G. GAULT

The States Corporation of Chicago, Illinois, have just been awarded a contract for the construction of the Central City yards of the Illinois Central Railway. Mr. John C. Paskins will be superintendent for the above company and will open headquarters at Central City. Mr. Paskins expects to begin construction at an early date, and will equip this job with a battery of two shovels, one 88-C Bucyrus, and one 103-C Bucyrus, with three standard locomotives and 24 Western dumps, of from 12 to 30 yards capacity.

Mr. Paskins expects to have material moving within 30 days. The above work involves around 900,000 yards of excavation of which amount 65% will be solid rock.

The Illinois Central Railroad Company have awarded a contract for 28 miles of grading on a new line in Kentucky to A. A. Gutherie and Company. Work is to start at once and be completed October 1, 1923. The new line will be from a point near Dawson Springs to Central City, and is so located as to pass through valuable coal lands. The work as a whole is of heavy construction, averaging over 60,000 yards to the mile, or a total yardage of two million, of which about 30% will be solid rock.

The Gutherie Company will attack this work with a battery of about 12 steam shovels, both of standard and narrow gauge, besides the usual grading equipment.

Our representative was successful in snapping the accompanying view recently, of W. W. Coleman, President of the Bucyrus Company, (to the right) and W. H. C. Mussen, the "Big Chief" of Mussens Limited (to the left) which company represents the Bucyrus Company in Eastern Canada. The latter is shown endeavoring to persuade the former to schedule their next conference in the more convenient atmosphere of Montreal.

G. A. Rosenbaum is operating a 225-B for the Hawley McIsaac Company, at Dawson Springs, Kentucky.

The Cook County Construction Company, Mr. W. G. Rammel, Naperville, Illinois, would like to get in touch with some outfit that can handle some work for them in the spring.

The work consists of 1.66 miles of grading, totalling 6177 cubic yards of excavation and 11,718 square yards of earth shoulders on Lincoln Highway near Sterling, Ill.

Any further information may be had by communicating with the above-mentioned concern.

Wm. Moeller is operating H. H. Hannankratt's 18-B at Kansas City, Missouri.

Alex Patton is craning a Bucyrus 70-Ton shovel for A. E. Dick at Beaver Brook, Pennsylvania.

J. Connelly is operating a Bucyrus 20-B for W. J. Newman at Chicago, Illinois.

Roy Black is operating a Bucyrus 80-B shovel for the Lavery Coal Company at Moundville, Missouri. Black hangs his hat at Liberal, Missouri.

George Hedges is operating a Bucyrus 80-B for the Lavery Coal Company at Nevada, Missouri.

H. L. Daniels is operating a Thew shovel for J. B. McCarthy, at Joliet, Illinois.

Intermountain News

BY H. N. STEINBARGER, DENVER, COLO.

Fort Hall Project

The new office which has recently been installed in the Boise Payette Building, Blackfoot, Idaho, for the purpose of handling the reconstruction and enlargement of the Fort Hall Irrigation System is settling to work.

This office will handle all the work of the irrigation and reclamation department of the Federal Government in Idaho, Nevada and Utah, that has formerly been handled at Salt Lake City. The reason for this change is that at the present time there is greater activity in this section than in either of the other states, and it is therefore in a more centralized position in regard to the work.

The work contemplated on the Fort Hall Project, according to newspaper reports, will involve the expenditure of about a million dollars within the next two years.

Two steam shovels and two dredges have been operating on the work for a few weeks, but were forced to close down because of the severe cold weather in this section. The work will be resumed in the spring when the enlargement of the Idaho and Indian Canals will take place. Besides this, preparations will be made for controlling the waters of Sand Creek that have been causing so much loss along that stream for a generation. Mr. Charles A. Engle, who was formerly in charge of the construction work in the Minidoka and Boise Projects and in recent years was the engineer in charge of construction work on the Colorado River Valley Project in Arizona, will be in charge of the work on the Fort Hall Project.

New Mexico

Pete Chapman is craning a Marion 91 for the Chino Copper Company at Santa Rita, New Mexico.

F. L. Busby is operating a Bucyrus 30-B for the Atlas Portland Cement Company at Leeds, Alabama. Fletcher West Brooks is firing.

New York News

BY T. A. BURNS

The numerous old friends who are constantly inquiring as to the whereabouts and activities of Alex McKenzie will be pleased to know that he and his brother Robert McKenzie are now very successfully engaged in a general contracting business with headquarters in New York. In fact they have been so fortunate that they are having considerable difficulty in getting very far from home, and have now underway five different projects in Kings County, where they are making the "dirt fly" and concrete stand. With their present equipment, past experience and native financing abilities they are bound to go far, and we know their friends will join with us in wishing them every success. Some of Mr. McKenzie's important connections were with James Stewart and Company, Ruggles & Robinson and Snare & Trieste, as well as having had an especial important commission under the Associated Contractors.

Mambrino & Rizzetta, Contractors, a firm composed of Mr. A. Mambrino, A. Rizzetta, James Gillarde, M. Rizzetta, and A. Caruso, may be considered new but to say the least they are "fast workers." In business for only a year they have been continuously adding to their equipment, and now are swamped with work. Labor or other troubles are not likely to handicap any organization composed of individuals with the physical powers and business ability possessed by these gentlemen. Forty thousand yards, containing a few boulders and a cliff, is no impediment to the satisfactory completion of a contract in time to beat tax exemption laws.

Northwestern States Notes

BY A. B. HANCE, PORTLAND, OREGON

The Long View, Portland & Northern Railway Co. has altered its plans for the construction of a railway and will receive bids again, this time for the construction of the entire main line, about 25 miles in length, from the North Kelso city limits to the head of the Arkansaw Creek. This work will be done by the Long-Bell dredges.

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The contract for the 10 miles of surfacing of the Pasco-Kahlotus Road near the town of Kahlotus was awarded to G. I. Stickler of Lewiston, Idaho. There were only two bids received.

The State and the U. S. Forest Service will complete the Crater Lake Highway from Medford to the lake. This means an expenditure of several hundred thousand dollars, the macadamizing of the nine miles this side of Prospect and of the 15 miles from Union Creek towards the park, making a complete highway of macadam from Medford to the lake to be finished within the next two years.

Spokane County has outlined its 1924 road-building program which calls for an expenditure of $850,000, and the construction of 100 miles of highway. County bonds for the amount will be issued by the county commissioners before January 1, 1924, which will be the final year, and the closing up of this $3,250,000 five-year bond issue road program. More than 43 miles of the highways to be built next year have already been surveyed, leaving some 57 miles of roadway yet to be located. Construction will cost between $8,500 and $10,000 a mile, and provides for macadam finish 16 feet wide and 8 inches thick. The base will be of crushed rock. Possibly the longest stretch of road to be built next year is the Chattanroy-Blanchard Road, a distance of 16 miles. This will cost approximately $140,000. Probably the next in length is the Seven Mile, Four Mound and Coulee Hite Road. This stretch is 15 miles long and will cost about $125,000.

On February 6th and 7th, bids were received by the Oregon State Highway Commission, Portland, for considerable grading, surfacing and bridge work in various counties of the State.

The Tygh Section in Wasco County which calls for 6 miles of grading of the Dalles-California Highway, was awarded to Elliott, Scroggins & Pacquet at $194,050.

The Crooked River Section in Crook County, consisting of nearly nine miles of grading and 89,000 cubic yards excavation, was awarded to the Crook County Court at $76,619.50.

The Coquille Section in Coos County, calling for 2.4 miles of grading and 220,000 cubic yards of excavation, was rejected and will be readvertised for the March meeting.

Port Orford-Sixes River Section, with 3.3 miles of grading and 6.1 miles surfacing, 32,000 cubic yards excavation, 11,900 cubic yards surfacing materials, was awarded to John Hakanson at $49,425.

Heppner-Jones Hill Section, Morrow County, 11.48 miles of broken stone surfacing, was awarded to the General Construction Company at $51,592.00.

Keno-Klamath Falls Section, 10.98 miles of grading and surfacing, was awarded to Dunn & Baker, Klamath Falls, Oregon, at $142,473.25.

A bridge over Basket Slough near Rickreall, requiring approximately 125 cubic yards concrete, 14,000 pounds metal reinforcement, 650 lineal feet piling, 90 lineal feet handrail, and 230 cubic yards excavation, was awarded to the Oregon Contract Company at $5,372.50.

Mr. Roger LaBelle is now operating a 30-B Bucyrus shovel in operation at Longview, Washington.

Pacific Coast News

BY P. H. BIRKHEAD, SAN FRANCISCO, CALIFORNIA

Plans have been completed and an application filed by G. G. Hooper of Constantia, Lassen County, for the appropriation of 17,000 acre feet from Long Valley Creek, in Lassen County, for the irrigation of about 4000 acres of land. It is proposed to construct the following: Canals—73,920 feet in length, 15 feet wide on top, 6 feet on bottom, 3 feet deep, canals will be concrete lined; Dam—an earth and rock fill concrete core storage dam will be constructed 90 feet high, 480 feet long on crest, 150 feet long on bottom, 15 feet wide on top, project is for the Pyramid & Live Stock Co. who will irrigate 12000 acres of Company land, and 2800 acres in Long Valley, estimated cost $216,000.00.

Investigations and studies to determine the necessary sizes of canals, flumes, etc. are being made by the Board of Public Service Commission, City of Los Angeles, in connection with a proposed diversion of 200 section feet from Mono Lake, in Mono County, to supplement the present municipal water supply of the City of Los Angeles. Water will be stored in Silver Lake by the construction of a Dam on Rush Creek, at a point 1¾ miles below the present lake outlet. Water will be conveyed to the Owen River headwaters by a tunnel 11 miles long, and then through the Owens River Gorge Power Project to Los Angeles. This project will be known as the "Leevening to Deadman Creek Project" and is estimated to cost $6,000,000.00.

Plans and surveys have been completed by Chief Engineer R. F. Hartley, Oakdale, and the Oakdale Irrigation District will vote on issuing bonds in amount of $250,000.00 about March, 1923, for the enlargement of the North and South Main Canals to carrying capacities of 400 section feet and 600 section feet respectively.

Plans are being prepared by Consulting Engineer, J. B. Lippincott, Central Building, Los Angeles, for the construction of an irrigation and distribution system for the proposed Santa Fe Irrigation District, in San Diego County. Authorization has been granted by the County Supervisors for the formation of the District, and plans are now before the State Bonding Commission for approval. Water will be obtained from Lake Hodges and distributed by canals and pipe lines, etc. The District will embrace about 11,000 acres.

Contract has been awarded to T. B. Shank, El Centro, who bid $.275 per cubic yard, total $22,000, for alignment of the Alamo Channel for the Imperial Irrigation District, El Centro, Imperial County, work involving 80,000 cubic yards excavating. J. H. McIver is Secretary of the Imperial Irrigation District.

Contract has been awarded to A. Rife, Blythe, who bid $.18 per cubic yard for excavation in connection with construction of levee and canal for proposed Settling Basin, work involving 94,000 cubic yards excavation, and earthwork. Work is for the Palo Verde Mutual Water Company, Blythe, Riverside County.

Contract has been awarded to W. E. Hanrahan, 402 Griffith McKenzie Building, Fresno, for the construction of 13.4 miles of highway in Merced County, the Dos Palos Section to be 4 miles and the Volta Section to be 9.4 miles in length. Bid was $331,000.00.

Governor Elect George P. Hunt, Arizona, recently announced the selection of Frank R. Goodman, of Flagstaff, Arizona, as the appointee for the position of State Engineer when the administration goes into office. Mr. Goodman will succeed Tom Maddock, State Engineer under Governor Tom Campbell.

Plans are being completed by Chief Engineer John A. Beemer for the second unit of the Storage System for the Walker River Irrigation District to irrigate lands near Yerington, Nevada. Work will involve the following: Storage Dam—to impound 42,000 acre feet to be constructed on the East Walker River, 125,000 cubic yards earth and rock fill, 1,000 cubic yards reinforced concrete, 20,000 cubic yards earth and rock excavation. Total estimated cost $175,000.00. Bonds have been voted in amount of $918,500 to cover the cost of works for this district. Bids for the construction of the Dam will be called for about April, 1923.

Contract has been awarded to the United Dredging Co., Central Building, Los Angeles, who bid $209,900.00 for construction of Unit No. 1 of a Mole-Type Pier for the City of San Diego, involving 305,000 cubic yards of earth dredging, 12,000 tons of rock fill and concrete curtain wall complete.

Plans are being completed by Engineer James B. Girand, Gooding Building, Phoenix, Arizona, and permit granted by Arizona State Water Commission, for the construction of a power development project on Diamond Creek, total estimated cost $40,000,000.00. It is proposed

to construct a dam 250 feet high, masonry construction, to back water up Diamond Creek about 25 miles. A power plant will be constructed with a capacity of 120,000 H.P. It is expected that construction will start shortly.

Plans have been completed by Nevada State Highway Department, Mr. Geo. W. Borden, State Highway Engineer, for the following projects: Churchill County, 10.24 miles of 10-foot gravel road between Westgate and Eastgate; Douglas County, 4 miles grading and 25% surfacing, from 3 miles north of Carters to Holbrook; Churchill County, 0.95 miles of 12-foot gravel surfacing in vicinity of Grime's Ranch; Lincoln County, 9.56 miles 10-foot gravel over portion of distance between Pony Springs and Dutch John's; Clark County, 8.20 miles 19-foot gravel surfacing from Rev. Apex to Crystal; Churchill County, 4.98 miles grading and structures between Fallon and 5 miles southerly.

C. W. Deterding, Sacramento County Road Engineer, has been selected by a committee composed of Sacramento County and Sutter County officials to prepare plans and specifications for the construction of the proposed joint highway for Sacramento and Sutter Counties, to be 26.48 miles in length, extending from the north end of the Natomas Boulevard to Oswald in Sutter County.

Contract has been awarded to David H. Ryan, 615 Fern Street, San Diego, at $15,528.00 for the construction of a standard gauge railroad from the Santa Fe Railroad through the Marine Barracks, Naval Base, San Diego. Bid for work complete was $21,527.00.

Alec Farrell, engineer, and L. D. Scott, fireman, are manning an Erie mucker at Palmdale, California, for Bent Brothers.

Engineer G. Parker is pulling the levers on a Sprague & Co. proposition at Kingman, Arizona.

Engineer Fred Signet is working on a Santa Fe proposition for Erickson & Petterson at Topoc, Arizona.

William O'Bryan, engineer, and Cy Perkins, fireman, are on the job at Nelson, Arizona, for Crook & Henno.

Joe LeBel and "Whitie" Pearsall are manning a shovel on State Highway work at Jucumba, California.

John Berg, better known to the "perfesh" as "Blondie" is on a Twohy Brothers' project at Tempe, Arizona.

Rusty Adams, egineer, S. Polkonhon, craneman, and Geiselman, fireman, constitute the fleet of able seamen at Santa Monoca on a State Highway Commission project.

J. P. Kerwan "mushed in" from the works at Big Creek to spread himself through the holiday siesta. The Brother reported the bright lights just as ruddy as ever and the "jackass bolsheviki" as hard to corral, and "pretty rotten" when you do spot it.

C. Brown, engineer, George Parkhill, craneman, and "Scratch" Colwell, fireman, are working at Fullerton, California, for the Wabis Construction Co.

C. Marshall, engineer, Jeff Hughes, craneman, and T. O'Malley, fireman, have departed for Big Creek, the project now being pushed by the Southern California Edison Co.

D. Brady, engineer, Cash, craneman, and Crawford, fireman, are tearing things up at Catalina Island, for the Harbor Commission.

Plans and specifications are being completed by Engineering Department of the Southern Pacific Railroad Co., Market and Spear Street, San Francisco, for the construction of a 20-mile railroad between Calipatria and Holtville, in Imperial County. Grading will be light excavation, probably team work.

Preliminary plans are now being prepared by Consulting Engineers Leeds & Barnard, Central Building, Los Angeles, for the construction of a harbor project at Santa Barbara, estimated to cost $500,000.00. Preliminary plans are also being prepared by City Engineer Geo. D. Morrison for certain beach improvements, to cost an additional $500,000.00. Funds are to be raised later to finance the construction.

The Beason Construction Co. of Ogden, Utah, are making preparations for starting a road job which was awarded them recently in the southern part of the state.

John Farrell is operating a Model K Marion for the Southern Pacific Company on realignment work near Surf on the Coast Division. He gives us the information that his son, J. Farrell, is still operating a Marion 40 on the Big Creek work of the Southern California Edison Company's work, being located at Camp 33. His other son, Alex. F. Farrell, is operating an Erie at Palmdale, California.

Contract has been awarded by the Hallwood Irrigation District, Marysville, California, to John Phillips, 637 Santa Ray Avenue, Oakland, and Sacramento, for widening, deepening and cleaning out ditches of the District.

Contract has been awarded to David H. Ryan, 1615 Fern Street, San Diego, California, who bid $92,855.00 for the grading of 10.9 miles of the Adin to Adin Summit National Forest Highway, about 28 miles southwest of Alturas, Modoc County.

Bates & Borland, Oakland, are progressing very satisfactorily with their contract for the California Memorial Stadium which is being built in Strawberry Canyon on the Campus of the University of California. They are working day and night against time to complete the excavation and the structure so that it will be completed in time for the big football game between California and Stanford in November, 1923. Thus far they have put in a concrete culvert to handle the flow of Strawberry Creek and are now working on excavation and beginning concrete work. Bates & Borland's 18-B Bucyrus shovel is busily engaged on the excavation work and is being handled by the veteran operator Jim Moynihan.

According to progress made in the Glenn-Colusa Irrigation District up to the first of the year, over thirty miles of ditches have been constructed with a total yardage moved of 200,000 yards. The drains are being constructed with two dragline excavators which are owned and operated by the District. It is stated this drainage work is being done at a relatively low cost, the cost of digging ditches being from 11c to 15c per cubic yard. The plans provide for the ultimate construction of drainage ditches extending to the low point of each 160-acre tract or smaller area in the District, at an estimated cost of about $6.00 per acre. There are about 150,000 acres in the District. Fred H. Tibbetts is the engineer for the District.

Southern States News

BY C. N. BALLENTINE, W. W. WHORLEY, AND L. E. MACDONALD

Excavation has been started for the foundation of the Tennessee Memorial Building and Capitol Annex which will be located on Capitol Boulevard in Nashville, Tennessee. The building will serve as a memorial to those who fell in the recent war and will contain many of the State offices. Contract for this structure was awarded to the A. J. Krebs Company of Atlanta at a figure of $1,240,000.00. Mr. Joe Lightman of Nashville has the subcontract for grading.

Grading work for the new River and Rail Terminal at Memphis is about completed. Construction work and pile driving has been hindered, due to the recent rains and high stage of the Mississippi.

Construction work on the new Pump Station in North Memphis is being pushed by D. D. Thomas & Company. Excavation for this project is being handled by Mr. George W. Turner. George R. Hurd is operating and C. D. Hutton craning a 70-C on this job.

Tentative arrangements are being made for the construction of a concrete viaduct at the end of the Harahan Bridge at Memphis, Tennessee. This will be located on the Arkansas side and will connect the end of the bridge with the levee system. This is the only bridge across the Mississippi south of St. Louis, and a large volume of highway as well as Railway traffic is handled. It is expected that the cost of this work will be paid jointly by the States of Arkansas, Tennessee and the City of Memphis.

The Dixon Transfer Company of Anniston, Alabama, was awarded contract for the rebuilding of part of the county highway between the town of Piedmont and the Cleburn County line.

Reid & Lowe of Birmingham, Alabama, are doing some improvement work on the Frisco.

M. L. Porter, who has been handling a 70-C on the River and Rail Terminal job in Memphis, reports that he is headed for Newport News, Virginia, where R. G. Hill & Company have secured a yard grading job for the Chesapeake & Ohio Railroad.

J. T. Moses called at this office recently. He has left for the coal-stripping fields of West Kentucky where he expects to be located for some time.

The many friends of P. S. (Pete) Needham will regret to learn that he slipped while climbing on his shovel recently, fracturing a rib. Better luck next time, Pete.

Costello Bros. of Knoxville have recently been awarded a very nice road job in Kentucky.

A. J. Kreis Construction Company of Knoxville, in conjunction with the Crippen Contracting Company, were one of the active bidders on the recent Illinois Central work at Madison, Kentucky. The Kreis Company also has some work near Mulberry, Florida.

The State Highway Engineers held a Good Roads Conference in Knoxville the 24th and 25th of January. Several contractors were present and many fine talks were given regarding road-building in general. There is quite a bit of agitation in the Southeastern States in the interest of more and better roads. The general opinion predicts a prosperous year in the road-building game.

The Morrow Transfer Company of Atlanta, Georgia, have a very nice job in the dirt-moving end of the new Biltmore Hotel soon to be erected in Atlanta. This job in the aggregate amounts to $10,000,000.00. J. W. White is superintendent of shovel work on this job. M. B. McEver is handling the front end of an old Thew and his brother W. M. McEver is moving dirt with a Marion 28.

CHARGED WITH THEFT OF STEAM SHOVEL

Brock Brothers Declare that Stranger Sold Them Machinery for $20—Are Bound Over

The historic Farmer Hayseed who bought the Woolworth Building from the street corner loafer had nothing on Depurd and William Brock, Knox Mountains, according to the story they told Squire Fields this morning in their preliminary hearing on charges of larceny.

Charged with the theft of a steam shovel from the Knoxville Brick Company, the Brock brothers told the squire that they had bought the machinery from a man named Williams, for $20, Williams, whom they said, was standing near the shovel and offered it to them at bargain figures. They dismantled the machinery and sold it for junk. Both admitted they would not recognize Williams if they saw him again.

They were bound over to criminal court under bonds of $1,500 each.—*Knoxville Sentinel.*

St. Louis Items

BY A. B. KOENIG

A. Guthrie & Co. were awarded 28 miles of steam shovel work by the Illinois Central Railroad near Madisonville, Kentucky. They will sublet all or part of this. Contractors interested get in touch with J. C. Baxter in charge of their office at Madisonville, Kentucky.

The Missouri Public Service Commission issued a formal order for the construction of the Fourteenth Street Viaduct over the Mill Creek Valley here and made the following apportionment of cost for the work. Terminal Railroad Association and Missouri Pacific Railroad (by agreement of these roads) $300,000, United Railways Company $25,000 and the City of St. Louis $302,000. The total cost has been estimated at $627,000. The viaduct was partially wrecked on February 12, 1920, through the derailment of a passenger train. The new viaduct will be 1200 feet long and 80 feet wide, extending from Spruce Street to Chouteau Avenue, the north and south extremities of the Mill Creek Valley at this point.

The Cotton Belt Railroad is spending considerable money improving its conditions at Brinkley, Arkansas, according to officials of the road. A new water tank and cinder pit is being built, the grounds about the station are being planted in early spring flowers and small extensions of tracks are being considered. Work on the roadbed is going ahead rapidly. New bridges are being built where necessary and the track is being reballasted.

C. R. Barton & Son report their 15-team outfit idle at Saint Genevieve, Missouri. They are ready to move on to any kind of grading, road or railroad work. Box 166, Saint Genevieve, Missouri, will catch them.

Steel was delivered on January 28th for the construction of the new $265,000 viaduct over the Santa Fe tracks west of Twenty-eighth Street in Kansas City, Kansas. Work will start immediately on the construction, officials promised the city commissioners. The viaduct will replace an old structure which has been condemned.

The Frisco has under consideration the construction of a new line of track from Empire, Alabama, to Arkadelphia, Blount County, Alabama. It will be about 22 miles in length. The line will tap what is said to be the greatest coal field in Alabama and will give to the Frisco added heavy coal tonnage. No announcement has been made by President J. M. Kurn of the Frisco when this line will be built, but from a reliable source it is reported it will be started and completed next summer. The new mines have no transportation facilities now and the Frisco will therefore get the entire tonnage.

The State of Illinois has contracted for 2,900,000 barrels of cement, a sufficient amount to build 1000 miles of hard roads in 1923, according to an announcement made to Frank T. Sheets, State Superintendent of Highways. The Department asked bids for approximately 4,500,000 barrels of cement some time ago. Inability to secure the required amount at a satisfactory price will interfere somewhat by reducing the supply to counties and will force some counties to enter the open market to secure sufficient cement for contemplated road work. Eight hundred miles of road are now under contract for work next year, and unless additional cement is secured only 200 more miles can be contracted for. However, the State will continue its efforts to secure more cement so that road building will not be curtailed.

Mulvill Bros., Alton, Illinois, have 100,000 yards of team work on the Chicago & Alton Railroad in East St. Louis to sublet.

The Board of Public Service on February 6th opened bids for street construction work in various parts of the city aggregating $438,498.55. The bids submitted came within the estimate placed on the work. The improvements to be made, with the names of the low bidders and the construction cost involved, are as follows: West Florisant Avenue from Union Boulevard to Kings Highway Northwest, asphalt paving, $139,083.75 by the Trinidad Asphalt Manufacturing Co.; Seventh Street from Chouteau Avenue to Market Street, recut granite block paving, $86,655.50 by the Independent Quarry & Construction Co.; Arsenal Street from Fifty-ninth Street to The Frisco Right-of-way, concrete, $86,637.90 by the Shrainka Construction Co.; Taylor Avenue from Broadway to West Florissant Avenue, bitulithic paving, $54,842.20 by the Granite Bituminous Paving Co.; Clayton Avenue from Vandeventer to Kings Highway, asphalt paving, $53,014.75 by the Independent Quarry & Construction Co.; Chouteau Avenue from Compton to Grand, asphalt paving, $18,264.45 by Orie S. Brighton.

Geo. Dameron has his 20-team outfit working by the day in Kansas City. He wants a contract for some grading, and is ready to move on to it immediately. Address him in care of Koenig Labor Agency, 501 Delaware Street, Kansas City, Missouri.

28356

Jones & Jordan, Pierce Building, St. Louis, Missouri have 90,000 yards of state road work to let in Saint Charles County, Missouri.

H. F. Riley of Clapp, Riley & Hall Equipment Co., Chicago, was here buying all the idle contractors' equipment he could get hold of. Looks for a big year in the contracting line.

Mulvill Bros. are arranging to put forces on the second track contract between Miles and Shipman, Illinois, on the Chicago & Alton Railroad. They expect to have a force of 100 teams and men, 3 steam shovels and 2 train crews at work between these points within a short time. They now have their steam shovels and other equipment at Brighton, which point is where the second track is now completed.

Jerry Connors passed through here on his way back to Chicago, returning from taking his brother Tim to a hospital at Savanna, Mo. Tim is suffering with a cancer.

Little & Dean of Hernando, Mississippi, and the Allen Gravel Co. of Memphis were low bidders on 35 miles of road surfacing in Mississippi.

Ross E. Mitchell, engineer in the Government service here, was accidentally killed by an elevator in the Imperial Building on January 27th.

Zay Gardner was awarded contract for 120 miles of track laying and ballasting for the International & Great Northern Railroad in Texas.

List & Gifford Construction Co. were awarded contract by the Burlington Railroad near Weston, Missouri. They are moving their grade and track away from the Missouri River.

Rom Walsh and Dan Terry of the Walsh Construction Co. were here last week. They may report something interesting in the next issue. Terry says they are still piling up big estimates on their New York Central work near Albany, New York. Snow has interfered a little with them.

Contractors when in want of work or labor for their outfits write or wire Koenig Labor Agency, 612 Walnut Street, St. Louis, Missouri, or 501 Delaware Street, Kansas City, Missouri.

West Virginia News

BY J. CLYDE MC DERMITT

The members and officers of The West Virginia Road Builders Association took advantage of the opportunity presented at Charleston on January 30th by the big State road letting to get together for a "big feed" as Joe Randich has been wishing for, and which as Joe predicted was a grand success. The time was 8 o'clock, and the place the Kanawha Hotel. Short talks were made by Chairman Fortney of The West Virginia State Road Commission, Mr. Smith of the Pennsylvania Association and several other first-class after-dinner speakers, including Riley Wilson, who was at his best, and as usual was the life of the party.

The Secretary of State recently issued a charter to the Dougher-Boone Construction Co. of Charleston, West Virginia, with an authorized capital stock of $1,000,000. This concern formerly operated under the name of John E. Dougher & Sons, and has contracts in several counties of the state, specializing in bituminous macadam construction of State highways. They also received an award of 8.7 miles of the above class of work in Greenbrier County at the last State letting. We predict for them a great future in West Virginia for they are all high-class men.

It looks like a sure sign of spring to see our old friend Joe Carole in Charleston the other day at the letting, but Joe informed us that he was only looking on and had heaps of work on hand to keep him busy for some time.

A bill has been presented in the State legislature asking for the issuance of $15,000,000 additional bonds to carry on West Virginia's road-building program.

We are going to get some snapshots of West Virginia's road builders in action in the near future just to show the world what we are doing down here.

The State Road Commission of West Virginia announced on February 3rd the awarding of the following contracts for road work: Raleigh County, 6.2 miles, A. Keithley, Charleston, West Virginia, $91,521.38; Pocahontas County, 8 miles, Battershill & Goode, Virgilinia, Virginia, at $77,065.45; Pocahontas County, 2 miles, Waugh Bros., St. Albans, West Virginia, $39,486.59; Greenbrier County, 8.7 miles, Dougher-Boone Construction Company of Charleston, West Virginia, bituminous macadam, $305,531.88; Monroe County, 4.9 miles, Roberts Construction Company, Pulaski, Virginia, $88,268.14; Boone County, 2.23 miles, Coda & Nash, Huntington, West Virginia, $48,049.27; Jackson County, 4.7 miles, C. F. McQueen, Charleston, West Virginia, $39,100; Wetzel County, 6 miles, Ritchie & Ritchie, Ravenswood, West Virginia, $30,600; Marshall County, 3 miles, Stringer & Springer, Wheeling, West Virginia, $34,000; Tyler County, 4.9 miles, Chas. V. Walker, Freemont, Michigan, $67,200; Preston County, 3.4 miles, W. J. & J. T. Gephart, Elkins, West Virginia, $62,472.00; Marion County, 2.8 miles, Seiple & Wolfe, Youngstown, Ohio, $155,657.46; Barbour County, 7.2 miles, C. F. Price, Huntington, West Virginia, $126,530.41; Jefferson County, 6.6 miles, Moore & Leslie, Staunton, Virginia, $145,046.55; Hampshire County, 5.1 miles, McClure & Bingner, Johnstown, Pennsylvania, $62,725.30; Morgan County, 5 miles, Monongahela Construction Co., Fairmont, West Virginia, $121,668.25; Grant County, 12.25 miles, H. W. Kaylor, Cumberland, Maryland, $153,003.84; Pendelton County, 4.4 miles, Dayton Construction Co., Elkins, West Virginia, $77,518.65; Hardy County, 8.7 miles, L. J. Chandler, Virgilinia, Virginia, $68,737.90.

Canada

Winnipeg and Vicinity

Speaking in connection with the Hudson's Bay Railway, Sir Henry Thornton said that it would be a prodigious waste of money for the Hudson's Bay Line to be entirely discarded if the road were really feasible and its ports of practical work. Sir Henry in this regard declared that no section of steel already laid was being taken up.

Mr. S. Nelson, for several years Track Superintendent of the Winnipeg Electric Railway, died at Winnipeg recently.

Mr. W. S. Williams, Steam Shovel Superintendent of the Canadian National Railways, has returned to his duties after a severe illness.

Carter-Halls-Aldinger Company, of Winnipeg, have been awarded contract for the construction of freight shed and dock at Fort William, by the Canadian Pacific Railway.

A strong delegation from the Rainy River District, Ontario, waited on the Premier of Manitoba, asking that the Manitoba Government start work on the Winnipeg-Kenora Section of the National Highway. Consideration of the matter was promised.

The Standard Construction Company have started work on the construction of a concrete dock at the Fort William elevator. Mr. H. S. Hancock, Junior, is Superintendent of the work.

The Construction Department of the Canadian Pacific Railway will build the Northern Railway extensions in Alberta this spring.

Work to Let, Wisconsin

Anyone interested in bidding on an excavation job in Waukesha County, Wisconsin, consisting of the excavation of a strip of surface marsh varying from 200 to 700 feet wide and about 3 miles long along the shore of a lake, address A. C. Eierman & Company, 204 Grand Avenue, Milwaukee, Wisconsin.

TRADE NOTES

The Portland Cement Association announces the opening of a new District Office, effective February 1, in the Hibernia Bank Building, New Orleans; this increases the list of Association District Offices to twenty-five. Association work in Louisiana and Mississippi will be directed from this office.

The District Engineer in charge of the New Orleans Office is John E. Tate, heretofore associated with our Atlanta Office as Field Engineer in North Carolina. Prior to joining the Association Staff, Mr. Tate was for two years Resident Engineer with the State Roads Commission of Maryland, and for three years Assistant Engineer Delaware State Highway Department.

REVIEW OF BOOKS and CATALOGS

We shall be glad to review, in this column, such books and catalogs as are sent to us.

JONES SPUR GEAR SPEED REDUCERS — Catalog No. 26, the edition of which has recently been announced by the W. A. Jones Foundry & Machine Company is now ready for distribution. This is an entirely new treatise on speed reduction drives, and the information contained therein should be of interest to all engineers or mechanics who specify mechanical drives for factories, mills, mines or plants, and any who are interested in speed reduction problems. Further information may be obtained from the *W. A. Jones Foundry & Machine Co., 4450 Roosevelt Road, Chicago, Illinois.*

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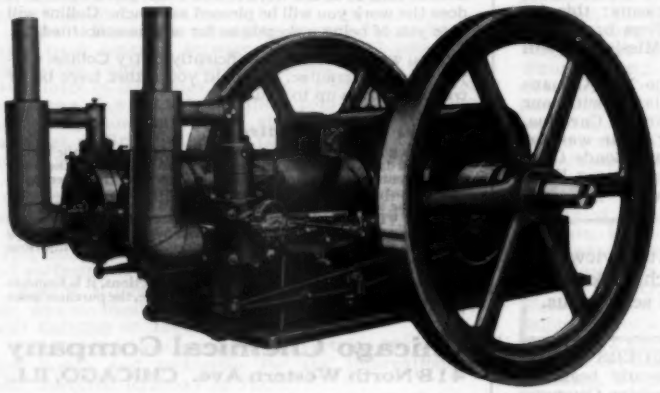

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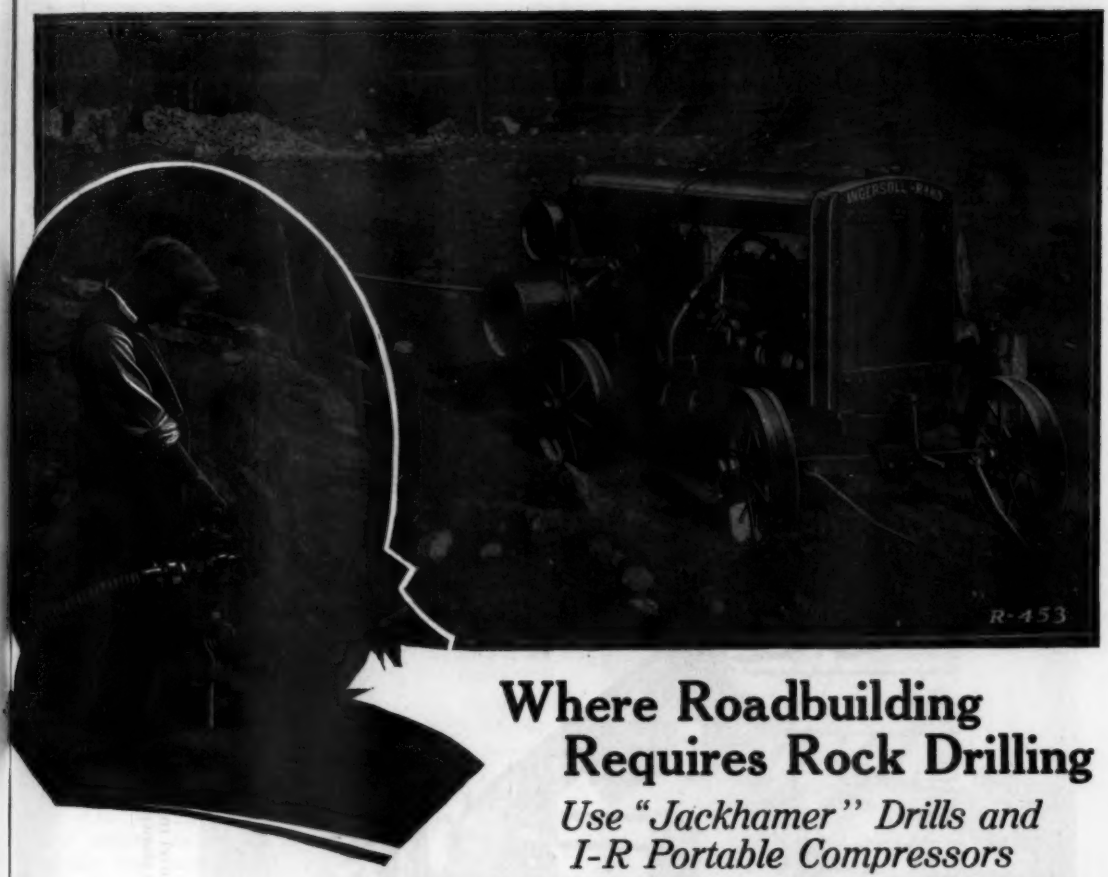

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Bucyrus 20-B "Bullseye" ¾-yard shovel mounted on caterpillars owned by Jefferson County, Alabama. The shovel is shown loading a truck from a 35-foot bank.